MaineDOT's Rosphalt 50 Projects

Most bridge decks in Maine are comprised of reinforced Portland Cement Concrete (PCC) sealed with a waterproofing membrane and Hot Mix Asphalt (HMA). This surface treatment has a life expectancy of 15 to 25 years.

Rosphalt 50 is another product that has been used since 1983 to seal bridge decks. This is a proprietary asphalt additive developed by Royston Laboratories Division of Chase Corporation in Pittsburgh, PA. It consists of concentrated thermoplastic virgin polymeric materials that, when added to HMA during the mixing process, combines with the asphalt to create an asphalt paving product that seals the PCC deck and provides a wearing course in one application.

Three bridges were selected for application of Rosphalt 50. Two in the South bound lane of I-95 in Howland and the I-395 Bridge spanning the Penobscot River between Bangor and Brewer.

Construction in Howland began with the removal of all but 0.5 inches of the existing HMA. Then the deck is brushed clean of debris and the deck and vertical edges were sealed with a proprietary deck and edge sealer and allowed to cure overnight.

Batching the Rosphalt 50 material begins with adding two 22.5 lb bags of Rosphalt 50 per ton of HMA into the pug mill prior to unloading into the truck. Rosphalt 50 requires high temperatures, in the range of 390° to 450° F as compared to 275° to 325° F for standard HMA, in order to compact the material to the desired density. Once the wearing surface is placed, the edge of the mat is sealed to prevent intrusion of chlorides into the PCC deck.

On the I-395 bridge the entire HMA and membrane as well as 0.25 inches of PCC deck were milled off and brushed clean. Repairs to the deck were made if necessary and the deck and vertical edges were sealed with a proprietary sealer.

The same procedure was followed to overlay the deck as was used on the Howland bridges except that two layers of Rosphalt 50 material was used to produce a wearing surface three inches thick.

Royston representatives claim Rosphalt 50 will last for 20 to 25 years. The cost for this application is slightly higher than a HMA/membrane surface but less than a latex modified PCC wearing surface.

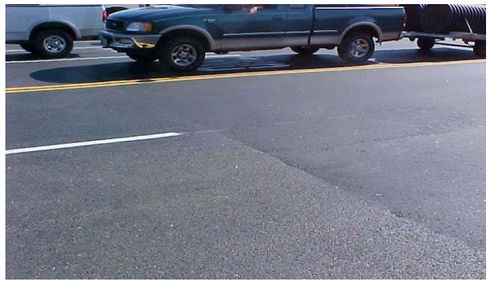
Rosphalt 50 will be monitored over a five-year period to evaluate the products life cycle and performance. Physical tests will include skid resistance, penetration, density, and chloride ion content. Visual tests include crack survey and surface inspection.

Stone Matrix Asphalt for Rut Resistant Intersections

The Maine Department of Transportation has experimented twice with the use of Stone Matrix Asphalt (SMA) which is a high strength mixture designed to resist rutting. The first experimental use of SMA was at the intersection of Route 4 and 126, Auburn in 1999. The second use of SMA was at the intersection of Route 1 and Turnpike Spur 703, South Portland in 2003. Both of these intersections have experienced problems with rutting due to high traffic volumes and the presence of heavy trucks.

SMA mixtures consist of a large coarse aggregate content, fine aggregate, high filler content, asphalt cement with or without a modifier and usually a cellulose or mineral fiber. SMA has a surface appearance similar to that of an open graded friction course, however it has low in-place air voids similar to that of a dense graded HMA. The high asphalt content produces a mixture that is easily compacted and that should be durable. If the asphalt content is excessive it will tend to push the aggregate apart and prevent stone on stone contact. The strength of a SMA mix is gained through this stone on stone contact.

Another important property to a SMA mix is to have the proper gradation. A proper gradation has an aggregate structure with a - low (30%) percent



passing the #4 sieve and a high (10%) percent passing the No. 200 sieve. This gradation ensures stone on stone contact by having the right amount of voids in the coarse aggregate. Without this gradation, the mix will be a lot of big particles floating in a weak matrix.

Results thus far from the Auburn test site have been less than successful. Overall rutting for the project after three years was 0.5 inches, however it was as high as 1 to 2 inches in areas. An asphalt content that was too high was thought to be the cause of the premature rutting.

February 2005

RESEARCH NEWSLETTER

A Publication from the Maine Department of Transportation's Research Division

MAINEDOT Maine Department of Transportation

Maine DOT - University News

MAINE ENGINEERING

MaineDOT and UMaine have recently completed the following studies.

Traffic Signal Safety

With red-light running crashes causing the death of about 1,000 people and injuring nearly 100,000 people per year around the nation, this study focused on Maine's intersections and how to make them safer.

The study had several components including analysis of crash reports on intersection crashes, field observations of driver behavior, and a public opinion survey.

The results showed that in 25% of the crashes caused by red-light running violations, the driver was unaware that the signal was red. In order to decrease the likelihood of people running red lights, most people in Maine suggested more photo enforcement, longer yellow times, and vehicle actuated intersections as the most effective solutions. It is also suggested in order to reduce the seriousness of a crash that all speed limits at signalized approaches should be no higher than 35 mph.

Behavior of Pile-Supported Integral Abutments at Bridge Sites with Shallow Bedrock-Phase 1

This study investigates the design criteria of reinforced concrete integral abutments on piles. Using finite element modeling, it is shown that current design procedures are conservative. The implementation of the proposed methods could potentially save hundreds of thousands of dollars in each two year transportation program. Phase 2 of the study is underway. An integral abutment bridge in Coplin Plantation has been instrumented. Results will be compared to Phase 1 design methodology.

Permeability of Base Material for Maine Roads

The objectives of this study was to extend pavement life and reduce pavement life cycle costs by developing improved specifications and design policies for subbase material. The research investigated the gradation and permeability of the subbase currently used by MaineDOT. The long term implications will be reduced life-cycle costs for highways in Maine.

The two parts of this study included determining the coefficient of permeability of subbase material used in Maine and comparing it to that recommended by the FHWA, and performing a cost analysis comparing the long term costs of road constructed using the standard Maine Type D subbase and FHWA permeable base.

In the service life analysis, the permeable subbase increased the service life of the road by 3.7 times. The permeable base was also found to be much more cost effective saving up to $127,000/mile of highway.

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For more information contact:

Dale Peabody
Transportation Research Engineer
Dale.Peabody@maine.gov

Bill Thompson
Research and Evaluation
Wlliam.Thompson@maine.gov

Doug Gayne
Product Approval Coordinator
Doug.Gayne@maine.gov

Mike Redmond
Concrete Mix and Design
Michael.Redmond@maine.gov

Tim Soucie
Pavement Engineer
Timothy.Soucie@maine.gov

Brian Marquis
Pavement and Roadway Research
Brian.Marquis@maine.gov

New Products

Hey, wait a minute!!!...what about a few Product Approval highlights?

TRUNCATED DOMES

Work continues on implementation of ADA-mandated, truncated-dome systems on Maine DOT projects. These are tactile warning curb ramp treatments for the visually impaired.

Presently, three types of products has actually been used in Maine. Domed-brick pavers have been used on Western Ave. in Augusta and Route 1 in Freeport. The biggest concern with any of these products is how well they will resist the forces of snow removal on the domes. These two projects, after only one snow-removal season, have not held up that well to sidewalk snow removal efforts.

Other types of products being evaluated in their first winter are polymer domed-panels, imbedded in concrete, in Machias and preformed thermoplastic installed on Rt. 100A Winslow and Rt. 103 in Eliot (see photo above). Both of those products have fared well in applications in other "snow" States.

3M's LIQUID PAVEMENT MARKINGS

Liquid Pavement Markings are a two-part, polyurea-based product for marking Asphalt and PCC pavement. This is a product that we are looking at not as a replacement for our waterborne pavement marking paints, but rather as an alternate product for high-traffic striping areas where a long-lasting, fast-drying line is desired.

Prior to striping, the pavement surface is grooved so that after striping, the marking paint surface is lower than the surrounding pavement surface allowing plows to pass safely above the markings without wearing directly on the line.

Some of the benefits of LPM's are:

- High initial and long-term reflectivity
- Dries track free in about 3 minutes or less
- Can be applied at temperatures down to 40° F
- Superior color
- Improved visibility during poor weather conditions
- Available in White and Yellow

Liquid Pavement Markings have been applied on one 3 mile test project on Route 4 in Avon recently and will be monitored by the Research Team for durability and retro-reflectivity.

New Geotextile Approved Product List Debuted

In order to make our Geotextile & Silt Fence Approved List more user-friendly to our internal and external customers, we have gone back to the drawing board and completely re-designed how the List is presented. We have worked closely with our geosynthetic vendors to ensure that the products we show meet our Specifications for their intended use. The new list is easier to read, and print if necessary.

As you may know, there were several changes to our Geotextile Specification (Section 722) in 2002. Essentially, we have incorporated the AASHTO M-288 Geotextile Specification for Highway Application into our own Spec.

Like our other lists, we are constantly updating so check back often for new products!

Next Issue Features:

- New Projects
- Concrete Maturity Meters
- Alternative Pavement Markings
- Maine Successes from FHWA's IBRC Program
- Intelligent Transportation Systems

Self-Consolidating Concrete (SCC) Gets Good Results

The Research Division has assisted the Maine DOT Maintenance & Operations Division and the Maine DOT Bridge Program with five experimental uses of SCC. The first use involved casting of precast prestressed voided box beam. Prior to using SCC, the bottom portion of the beam was placed prior inserting the void resulting in a delay of 30 to 45 minutes before the remaining concrete could be placed. Utilizing SCC allowed one continuous placement and also improved the compaction of concrete directly below the void which was critical due to the presence of prestressing strand in this area. On this project, half the beams were cast by conventional methods and half utilized SCC. A full research report is available including test results for Compressive Strength, Chloride Permeability, Air Void Analysis and Freeze Thaw Durability at the following web address: http://www.maine.gov/mdot/transportation-research/pdf/Report0310scc.pdf.

The Departments Bridge Maintenance Division has also utilized SCC on three projects during the past year. One project involved replacement of an abutment/endwall on a border crossing with Canada. Due to the problems associated with closing a border crossing for an extended period of time, the abutment was precast in 8 Pieces and then constructed during evening shutdown of the crossing.

Another application the Department utilized SCC was the casting of retaining wall blocks. These wall units were used as an alternative to drycast retaining wall blocks which the Department has experienced durability issues with. The SCC concrete was used as a substitute for the Departments Class A which is the typical bridge concrete.

Two of the most current uses of SCC have also been with the Bridge Maintenance Divisions and involved the rehabilitation of bridge pier caps and pier columns. SCC was chosen for these applications due to the superior flow-ability of this type of mix and also the excellent formed finish achieved when using SCC. The two recent bridge rehabs required concrete to flow the entire length of the pier caps and be able to work into the corners without the use of vibrators. The superior flow-ability of this type of mix enabled the crews to completely enclose the forms. The result was no areas of unconsolidated concrete with no patching required after stripping the forms. Feed back from the two crews which have used this new type of concrete was all positive, and if given the opportunity, both crews would use it whenever possible.

Although not a part of any of the research efforts studying self consolidating concrete, the economical aspect of this type of concrete may be the greatest benefit to the Department. There were significant time savings realized due to lack of vibration and no struggling to move concrete within tight forms. Additionally there was absolutely no finishing required after removal of forms.

If there is a downside to the use of this material, it would have to be the head pressures generated when using concrete which behaves more like a liquid than like conventional concrete mixtures. Standard forms were used on the Newport project but due to the height of the pier columns, some swelling and cracking did occur. Subsequently, on the Bethel project additional bracing was installed on the forms which seemed to solve the problem.

Although the Departments use to date has been very positive, at this point in time ASTM and AASHTO have still not addressed this material with a new specification. Until this happens MaineDOT will continue to evaluate this material but will not include it in our Standard Specifications.